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Forest Pest Management

Pacific Southwest Region

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To: District Ranger, Almanor Ranger District, Lassen National Forest

Subject: Entomology input to the Storrie fire assessment (NE00 - 24)

At the request of Judy Welles, Silviculturist, I conducted a field evaluation of the Storrie fire on November 7, 2000. The objective of my visit was to examine various areas within the fire, discuss marking guidelines and address questions posed by District personnel. Most questions involved some projections regarding the role bark beetles are likely to play in the fire damaged areas. Judy Welles, Russ Volke, District Silviculturist, Debbie Thurber, Small Sales Officer, Ron Perry, Marking Crew Foreman, all located at Almanor Ranger District, Tom Simonson, Forest Silviculturist and Rick Turcotte, Entomologist and Danny Cluck, Biologist, both with Forest Pest Management accompanied me in the field.

Background Information

The Storrie wildfire burned over 47,000 acres during August and September 2000. The fire occurred on the Lassen National Forest, the Plumas National Forest and on adjacent private lands. An estimated 27,000 acres burned on the Almanor Ranger District of the Lassen National Forest. The majority of the area (20,000 acres) that burned on the Almanor Ranger District is in "Off-base" per the Herger-Feinstein Quincy Library Group Act of 1999; therefore, management activities to restore vegetation loss is limited on these acres. Approximately 7,000 acres within the fire perimeter are available for restoration. District personnel are currently in the process of analyzing the proposed actions for the Storrie Post-Fire Restoration project.

Conifer species are predominantly red and white fir with some ponderosa pine, Douglas-fir, sugar pine, and incense cedar. The dominant hardwood species is black oak.

NORTHEASTERN CALIFORNIA SHARED SERVICE AREA
2550 RIVERSIDE DRIVE
SUSANVILLE, CA 96130
530-252-6667

Sheri Lee Smith
Supervisory Entomologist
E-mail: ssmith@fs.fed.us

It is the intent of the Ranger District to leave all trees that are likely to survive their fire-related injuries. Fire injured trees which are still alive will be evaluated for retention or removal based on criteria presented in The Guidelines for Estimating the Survival of Fire-Damaged Trees in California by W. Wagener (Misc. Paper No. 60, Pacific Southwest Forest and Range Experiment Station, 1961) and comments by C.P. Weatherspoon, where he summarizes and discusses the above mentioned guidelines and provides additional suggestions to facilitate the decision making process related to fire damaged trees (Weatherspoon, C.P. 1987. In: Proceedings of the 9th Annual Vegetation Management Conference, Nov. 3-5, 1987, Redding, California. Pg. 106-110.)

Field Observations

My observations during the field visit indicated very little bark beetle activity that would be associated with an increase in tree mortality. This would be expected due to the fire occuring after what would be considered the main beetle flight season for that area. In addition, it is anticipated that bark beetle populations in the area (as evidenced by very little tree mortality over the past few years) are relatively low due to the previous five seasons of above normal precipitation, which positively influences the health and vigor of the trees. The only beetle activity noted during the field visit was that of secondaries such as woodborers and ambrosia beetles.

The presence of wood borer frass on the boles, and galleries under the bark, was noted on several of the fire damaged trees. Woodborers and ambrosia beetles are common in dead and dying trees following wildfires and are important components in decomposition of the wood. There are a number of species of flatheaded (family Buprestidae) and roundheaded borers (family Cerambycidae) that mine in the sapwood, and in some cases, in the heartwood, of dead and dying trees. Attacks initially occur within the first few years after a fire. The damage to the sapwood and heartwood from these insects, along with fungal deterioration, can be a factor in determining the limit of practical salvage in an area. At this time, woodborers would not be expected to cause any concerns with the trees that survived the fire unless their extent exceeds about 1/3 of the circumference of the bole on individual trees. Their presence may become more important if we experience a dry winter and the fire-injured trees remain stressed.

Insects that bore into the sapwood and cause degradation also include the ambrosia or pinhole borers. The defect caused by this beetle consists of small holes surrounded by a dark stain. Galleries are constructed within the sapwood where the larvae feed on the ambrosia fungus, which is introduced by the female beetle as she constructs the galleries. Ambrosia beetles were present in the fire damaged trees as evidenced by piles of fine, white boring dust in the bark crevices.

The presence and extent of frass and boring dust, produced by ambroisa beetles and woodborers, is a key criteria for marking guidelines. These signs indicate beetle activity under the bark and are commonly associated with fire-related cambium damage. Typically, there is a narrow window of opportunity to use frass and boring dust as a marking criteria due to conditions such as wind, snow and rain which wash or blow the fine material away.

Discussion

Fire damaged trees can be placed into three categories: 1) those killed outright or so severely damaged by the fire that they are dead or will soon die; 2) those that are undamaged or lightly damaged and should survive, and 3) those in between. Trees in the third category present the greatest challenge when developing and implementing marking guidlelines and are also the trees that may provide the opportunity for subsequent attack by bark beetles.

Based on information from other wildfires in California, trees not injured by the fire either within the area of the burn or in the surrounding forest are rarely attacked as a result of the concentration of bark beetle attacks in fire-injured trees. As mentioned previously, a period of moisture stress could cause an exception. Concentration of beetles and related losses, typically occur within the first two years after the fire, so trees around the fire boundaries and islands of green trees within should be monitored for bark beetle activity through 2002.

Decisions about post-fire harvest and stocking levels affect the biological and economic potential of a stand. Unfortunately, it is often difficult to separate injured trees which are likely to live from those which are likely to die. The guidelines noted above (Wagener, 1961 and Weatherspoon, 1997) are the most appropriate to use for California forest conditions. Trees with moderate damage should be marked for removal when they do not meet the minimum criteria for survival.

Damage to the crown and intensity of the fire, which indicates cambium injury, provide an index to mortality. An adequate number of trees within descrete areas of the burn should be sampled to determine the level of cambium damage for a given area. Sampling the cambium for damage is the proper procedure to assess the extent of cambium kill. If the cambium is not going to be sampled, this criteria should not be used in marking guidelines as bark scorch alone doe not appear to be a consistent, accurate indicator of damage to the cambium.

If pines with some green foliage are cut, any slash >3 inches in diameter could be used as breeding material for pine engravers, *Ips* sp. During the warm parts of the year pine engravers can complete their life cycle in less than 2 months. If populations are allowed to build up and emerge from the slash they can attack standing residual trees and cause either whole tree mortality or top kill. Pine slash can be treated by lopping and bucking the boles and larger stems into the shortest pieces possible (varies depending on diameter but typically about 3 ft.). The material should be scattered so the stems are fully exposed to the sun to facilitate drying. Other methods of slash treatment include chipping, removing from the site, or piling and burning. Two practices which should generally be avoided are piling fresh slash without further treatment and/or allowing slash to remain in contact with or near leave trees.

Although low levels of bark beetle acitivity were detected during this field visit it is important to continue to monitor the trees for signs of these insects and allow enough flexibility within implementation of the restoration project to take action if warranted. I will continuing working with Judy Welles on the marking guidelines and will assist you with any further needs you may have. Please feel free to call me at 530-252-6667 if you have more questions or need to request additional assistance in the field. In addition, if you would like my assistance with responding to additional entomological questions at public meetings, on the I.D. team, or during other venues please let me know. I have attached a list of questions and answers regarding bark beetle and fire interactions. These questions have been asked by internal Forest Service employees,

members of the public and employees of other Federal agencies, and may provide some additional information for you.

Sheri Lee Smith
Entomologist
Forest Pest Management
NE CA Shared Service Area

Bark Beetle and Fire Interaction
Questions and Answers

1. What is the best way to identify insect attacked trees that are likely to die?

Successful attacks on pines are easily identified by reddish-colored pitch tubes on the bole. Pitch tubes that are cream in color are unsuccessful. All red turpentine beetle pitch tubes should be excluded when determining survivability. It would be prudent to mark pine trees that have successful attacks regardless of the extent of fire injuries. Frass in the bark crevices should be used as an indicator for other conifer species. Frass around the bole totalling at least 1/3 of the circumference can be used as a valid criteria in addition to or in the absence of fire damage.

2. What is the likliehood of survival for green, partially burned trees within intensely burned areas?

Sample some of the trees for cambium damage and assess tree crowns. Apply Wagener's guidelines with Weatherspoon's modifications and mark trees accordingly. As mentioned above, it is rare that bark beetles will attack in these islands of green trees; however, the trees should be monitored for activity.

3. If snags are retained within or near green clumps, does this put green trees at greater risk for insect attack.

There is no risk involving insects associated with leaving snags under the assumption that a snag is defined as a completely dead tree and; therefore, would not be viable habitat for bark beetles.

4. If higher snag retention standards were set within broader areas to maintain trees for eagles, does this increase the risk of insect attack throughout the surrounding area?

Similar to Question #3, there would be no increase in bark beetles associated with leaving more snags for eagle habitat.

5. Within SMZ's, how does snag retention affect the risk to remaining trees?

There is no risk regarding bark beetles and snags in SMZ's.

6. Does the species composition of the green trees influence the likelihood of their surviving insect attack? Size of tree? Location?

Yes, most of the bark beetles in California are host specific, so species composition plays an important role in stand and bark beetle dynamics. The trees of most concern for bark beetle-related mortality would be the pine species and white fir. Tree size appears to be important for the pine bark beetles. Typically pine trees greater than 8 in. dbh are attacked, but attacks have been observed in much smaller trees during protracted drought periods. Fir engraver usually attacks white fir trees greater than 4 in. dbh. Stand conditions in terms of species

composition, density, age, size and precipitation appear to be the most important factors involving bark beetle and host interactions.

Incense cedar, Douglas fir and the hardwood component are not typically associated with insects that would cause tree mortality.

7. If a 20 or 50 acre bald eagle nest core were identified, with all snags retained within this area, would this put surviving trees at a greater risk of insect attack? How would retaining snags along the water's edge affect insect infestation in the surrounding area?

See Answers #3 and #4 above.

8. Would removing a portion of the standing dead reduce the risk of insect attack?

No, there is no risk of attack associated with dead trees.

9. Approximately 200 acres of a 300 acre PAC burned intensely. What is the risk of insect attack to the intact area?

Based on my observations during the field visit there is little risk of post-fire bark beetle attacks in the areas that did not burn; however, they should be monitored for activity for the next two seasons.

10. Would intensively logging a strip or block along a road and/or implementing a non-commercial removal of smaller diameter snags adjacent to the PAC better protect the stand? Would underburning the stand?

The best way to reduce future bark beetle-related mortality is to maintain the stand at stocking levels that are appropriate for the site, including diverse species composition, ages and size classes. It is recommended that activities such as thinning or underburning be implemented during periods of relatively low tree stress (i.e. during high precipitation years and prior to stands becoming overstocked). This provides the opportunity for trees to recover quicker from the management activity and doesn't induce additive stresses on the trees. Additive stresses increase the susceptibility of successful bark beetle attack.

11. If there are small patches of dead trees within the PAC, does leaving these put it at greater risk to insect attack.

No, there is no risk associated with dead trees and subsequent bark beetle attack.